NATIONAL UNIVERSITY OF ENGINEERING
COLLEGE OF ELECTRICAL AND ELECTRONIC ENGINEERING

ELECTRONICS ENGINEERING PROGRAM

EE442 – LABORATORY OF ELECTRONICS II

I. GENERAL INFORMATION

CODE	**:**	EE442 – Laboratory of electronics II
SEMESTER	**:**	7
CREDITS	**:**	01
HOURS PER WEEK	**:**	03 (Laboratory)
PREREQUISITES	**:**	EE441 – Laboratory of electronics I
CONDITION	**:**	Mandatory

II. COURSE DESCRIPTION

The course trains the student in the application of experimental techniques in the management of transistorized circuits such as: feedback amplifiers, differential amplifiers, audio amplifiers and power amplifiers. Introduce the student to the management of integrated circuits such as operational amplifiers. Design and check the operation of sinusoidal oscillators and active filters with operational amplifiers. Specialized software is used to simulate the mentioned circuits.

III. COURSE OUTCOMES

At the end of the course the student will:

- Properly manage the digital multimeter, function generator, digital oscilloscope and regulated power supply by configuring and connecting them correctly.
- Identify the relevant variables of the amplifier, determine its gain, input and output resistance.
- Measure the electronic circuit variables accurately and verify the consistency of the values obtained.
- Tabulate the results in an orderly manner and make graphs that show the relationships and dependencies between the variables.
- Interpret the results correctly, generalize and formulate conclusions.

IV. LEARNING UNITS

1. **THE FEEDBACK AMPLIFIER**
   Measurement of voltage gain, input and output resistance.

2. **THE COMPLEMENTARY SIMETRY AMPLIFIER**
   Measurement of voltage gain, amplifier input and output resistance with transistor output and Darlington output. Frequency response of the amplifier.

3. **THE DIFFERENTIAL AMPLIFIER**
   Measurement of the voltage gain, input resistance and output of the differential amplifier with current source with resistance and with current mirror.

4. **THE OPERATIONAL AMPLIFIER**
   The inverting and non-inverting amplifier. Opamp frequency response. The adder and subtractor amplifier. Resistance measurement in differential mode and common mode.

5. **THE WIEN BRIDGE OSCILLATOR**
   Oscillation frequency measurement. Measurement of oscillation frequency with stabilization mechanism.

6. **ACTIVE FILTERS WITH OPAMP**
   Band pass filter. Frequency response. High pass filter. Frequency response.

V. METHODOLOGY

The teaching methodology of the course is based on:

- Practical exercise resolution classes.
- Qualified laboratory practices for the reinforcement of theoretical concepts.

In the laboratory sessions it is about exercising the concepts presented in the theory classes of the Electronic Circuits II (EE422) course, so they begin in the third week of the academic semester.

At the end of the course the student must prepare and present an integrating work or project. In all sessions the active participation of the student is promoted.

VI. EVALUATION FORMULA

During the semester 06 laboratory qualified practices, 05 of them are averaged, the one with the lowest grade is eliminated.

$$\boldsymbol{FA} = \frac{\boldsymbol{L1} + \boldsymbol{L2} + \boldsymbol{L3} + \boldsymbol{L4} + \boldsymbol{L5}}{\mathbf{5}}$$

VII. BIBLIOGRAPHY

- G. E. TOBEY, OPERATIONAL AMPLIFIERS; DESIGN AND APPLICATIONS McGraw-Hill Book Company Inc. First Edition 1977.

- LEONARD STRAUSS, WAVE GENERATION & SHAPING McGraw-Hill Book Company Inc. (2nd Edition, 1970)

- JACOB MILLMAN, “MICROELECTRONICS: DIGITAL AND ANALOG CIRCUITS AND SYSTEMS”, McGraw-Hill. (2nd Edition, 1979)